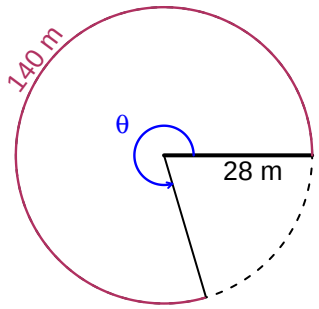
Name: Date:

Trig Final (Solution v49)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 140 meters. The radius is 28 meters. What is the angle measure in radians?

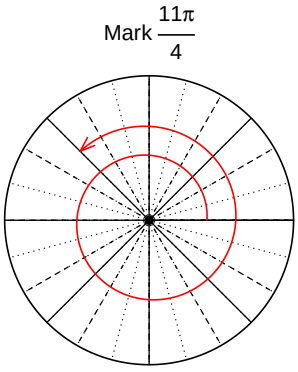


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

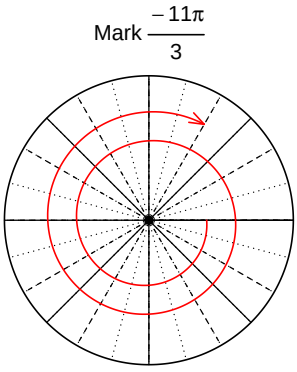
$\theta = 5$ radians.

Question 2

Consider angles $\frac{11\pi}{4}$ and $\frac{-11\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{11\pi}{4}\right)$ and $\cos\left(\frac{-11\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\sin(11\pi/4)$



Find $\cos(-11\pi/3)$

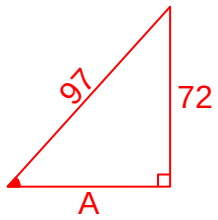
$\sin(11\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(-11\pi/3) = \frac{1}{2}$

Question 3

If $\sin(\theta) = \frac{-72}{97}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.

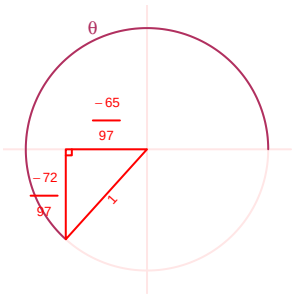
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 72^2 = 97^2$$
$$A = \sqrt{97^2 - 72^2}$$
$$A = 65$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\cos(\theta) = \frac{-65}{97}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -8.42$ meters, an amplitude of 4.35 meters, and a frequency of 2.56 Hz. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 4.35\sin(2\pi 2.56t) - 8.42$$

or

$$y = 4.35\sin(5.12\pi t) - 8.42$$

or

$$y = 4.35\sin(16.08t) - 8.42$$